

Craters of the Moon



# Teacher's Guide

to the

# Caves Trail & Indian Tunnel

for grades 1-5



# Teacher's Guide to Caves Trail

## How to use this manual:

This guide is intended as a foundation for field trips for elementary grades 1-5 and focuses on the most prominent features found along the Caves Trail. Subjects addressed include geologic processes, plant and animal adaptations, and Idaho state history. You can point out each feature to your class or utilize only those portions that meet your educational objectives. Each topic features:

**Identification guides** – Each feature is clearly described with text and accompanying images for ease of use on the trail.

**Inquiry focus** – Idaho science content standards for elementary grades emphasize observation, data collection, and critical thinking. This guide allows students to make observations of features along the trail and, where appropriate, suggest their own conclusions. Questions featured in each topic's *Next Steps...* are designed to help students practice these standards.

**Flexibility** – Use this guide on its own or in conjunction with other curriculum materials. The Caves Trail *Scavenger Hunt* and *Habitat – Where Life is at!* activity worksheet are available for download on the park website. Of course, the guide can be used with your own curriculum materials, as well.

Our goal is to provide you with curriculum materials that are educational on their own or as part of a broader unit. We appreciate any feedback from you on these materials so that we may keep them effective for your use for years to come.

### ***Tips for exploring the caves:***

- Get screened and obtain a cave permit for your class. See park staff for details.
- Sturdy shoes or boots are a must – no sandals or flip-flops!
- A round-trip visit to Indian Tunnel is one mile. A visit to all caves on the trail is almost two miles.
- Indian Tunnel is the largest, most well-lit cave, and is ideal for large classes and first-time cavers. Other caves feature lower ceilings, are darker, and have colder temperatures.

# Trip Planner

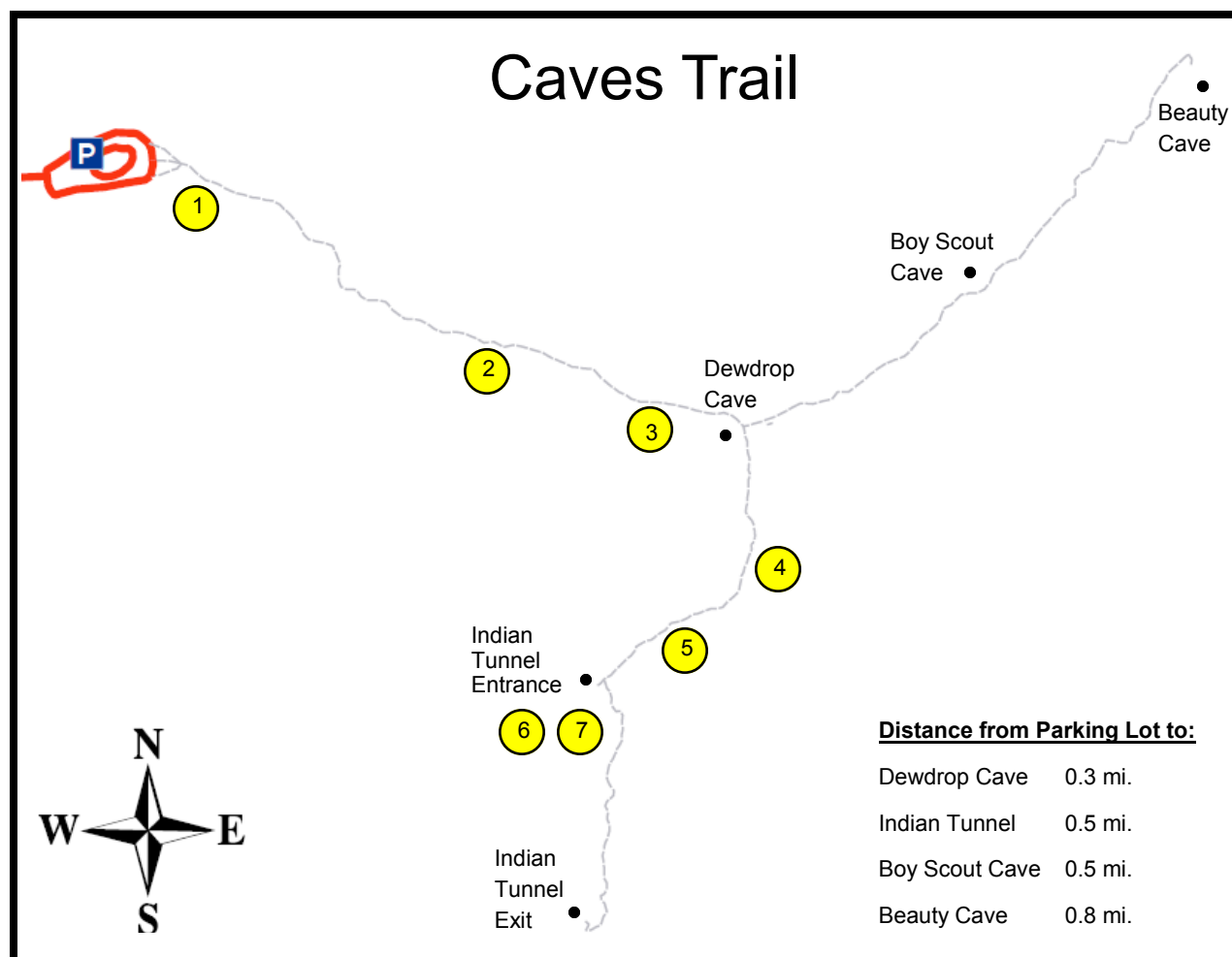
## Play it Safe

**Please stay on the trail.** Hike single-file to minimize off-trail hiking that can damage the lava's fragile surface. Falls on the jagged lava can cause serious injury.

**No collecting allowed.** Collection of rocks, plants, artifacts, and wildlife is prohibited by law. Take pictures and memories as your only souvenirs.

## Suggested Stops

1. A'a & Pahoehoe
2. Lava Tubes
3. Plant Adaptations
4. Hot & Cold Collapses
5. Rock Rings
6. Indian Tunnel: Stalactites & Skylights
7. Indian Tunnel: Looking for Wildlife





# 1 - A'a and Pahoehoe

**Location:** Trailhead

A'a and pahoehoe are made of the same material. But because they have different viscosity, they behave differently when molten and have very different forms. Use the descriptions below to point out the different lava types or have students identify the two types on their own:

**A'a** (*ah ah*) - Lava with a crumbled, broken surface. A'a forms from relatively cool, viscous lava. As the lava flowed the solid outer layer tore and crumbled, leaving a jagged pile of loose rock.

If you walk across a'a barefoot  
you might say *Ah! Ah!*



**Pahoehoe** (*pa hoy hoy*) - Lava with a smooth, often folded surface. Pahoehoe is relatively hot, runny lava. This lava oozed like syrup before hardening. Sometimes a skin of semi-solid pahoehoe forms on top, folding like taffy before solidifying completely.



## Next steps...

**Why do you think the a'a is near the edge of this lava flow?** *The edge of the flow cools faster than the center. As the lava cools it becomes more viscous, forming a'a.*

**Do you think you will see more or less a'a as you hike further onto the flow? Why?** *You will see more pahoehoe and less a'a as you hike to the caves. The caves are near the center of the flow, where the lava remained hotter and flowed more smoothly than at the edge.*

**Which type of lava has more plants growing on it? Why do you think that is?** *Pahoehoe tends to hold more plants. Cracks in the pahoehoe flows collect soil, seeds, and moisture. A'a has many crevices, but are often too deep for seeds to receive sunlight to grow.*

**Pahoehoe flows like syrup or honey. What type of food would you compare a'a to?**

## 2 - Lava Tubes

**Location:** Lava Tubes wayside

The wayside image and the small lava tube next to it offer a great place for students to understand lava tube formation.

Lava tubes begin as a river of molten rock. The top of the lava river, cooled by contact with the air, forms a hard surface. The ceiling traps heat inside the tube, which allows the lava to stay hot and flow through the channel, like water beneath a frozen river.



The lava eventually drains out the end, leaving a hollow lava tube cave behind.



### ***Next steps...***

**Does the top of this small lava tube appear smooth or rough? Is it made of a'a or pahoehoe?** *The surface is fairly smooth, not broken and jumbled. These clues indicate oozing pahoehoe lava formed the cave.*

**Animals often use lava tubes and other hollow openings in the surface. What are some advantages of using a lava tube as a den?** *Shelter from weather (heat, wind, rain), safety from predators, and a place to store food are some advantages.*

### 3 - Plant Adaptations

**Location:** South side of trail, shortly before Dewdrop Cave.

***Please view these features from the trail in order to protect the fragile crust of the lava.***

The Blue Dragon lava flow of the Caves Trail is home to a number of plants. Two distinct plants are near the trail just west of the Dewdrop Cave entrance.

**Syringa** - Next to the trail is a large syringa bush growing out of a crack in the lava. The syringa is Idaho's state flower. It leafs out in the spring and blooms white flowers in early summer. The plant is dormant much of the rest of the year.



**Ferns** - Take a few steps further towards Dewdrop Cave and look to the right at the base of a small lava overhang to find ferns growing in the crack. These Christmas ferns receive shade and moisture in the crack, staying green year-round.



#### ***Next steps...***

**What advantages do the syringa and ferns get from growing in these cracks?** *Soil collects in cracks over time, as well as water. Shade and shelter prevents sun and wind from drying out the roots.*

**Why does the fern stay green all year, while the syringa dries out and goes dormant?** *The syringa bush grows in the open, exposed to heat and drying winds. The ferns grow completely within a microclimate. The ferns are shaded from the sun and receive cool, moist air from the crack below. A microclimate is a small area with very different living conditions than nearby areas.*



## 4 - Hot and Cold Collapses

**Location:** Collapse wayside

***The trail is narrow here with steep drop offs – watch students closely to ensure their safety.***  
The collapses are on either side of the trail.

Collapses were once portions of lava tubes. As the river of lava flowed, the top layer cooled to form the tube's ceiling. Hot collapses occur when the ceiling caves in as it is still hot and partially molten (west side of trail).

Cold collapses happen when the ceiling cools into solid rock, then shatters as it caves in (east side of trail). Cold collapses can happen years or centuries after the lava has cooled.

### ***Food for Thought***

A hot collapse looks like a cake pulled from the oven before it has cooked all the way through, deflating in the middle.

A cold collapse is like a sheet of peanut brittle that shatters into many pieces after it has cooled entirely.

Cold collapse



Hot collapse

### ***Next steps...***

**Before identifying the two collapses, have students look at each and deduce the hot collapse from the cold collapse.** *As you look at the wayside, the hot collapse is in front of you, with the cold collapse behind you.*

**What might cause a lava tube to collapse now?** *Freezing and thawing of water in cracks, gradually driving the rocks apart, would be the most likely cause. A major earthquake might also, though the 1983 Borah Peak quake did not affect any caves on the Caves Trail.*

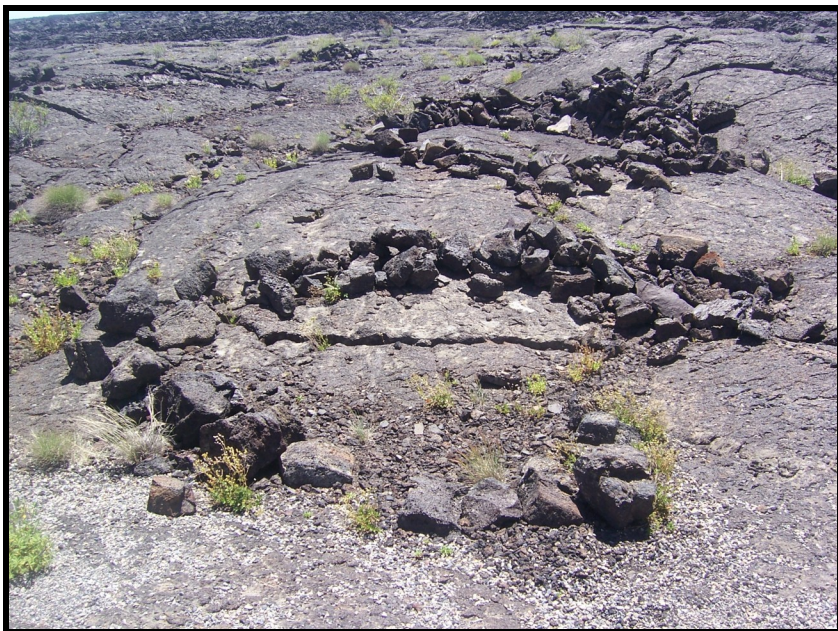
## 5 - Rock Rings

**Location:** Across from “Dangerous Pit Openings” sign

Continue toward Indian Tunnel from the Collapse wayside and you will find several rock circles to the left of the trail.

Humans explored Indian Tunnel long before the area became a national monument. These rock rings were built by Shoshone Indians before Europeans came to the area. The rock rings are no more than 2,100 years old, the age of the Blue Dragon lava flow.

It's unclear what the rings were used for, but ideas include their use as campsites or for ceremonial purposes.



### ***Next steps...***

**What other signs of human activity do you see nearby?** *Trail signs, the paved trail surface, and a staircase into Indian Tunnel are all nearby.*

**If you were here a thousand years ago like the Shoshone, what would you have used the cave for? Would you use the cave differently today? How?** *Ice and water can be found in caves even in the heat of summer, so Indian Tunnel may have once been used as a water source. In other Idaho caves, animal bones indicate the cool air inside caves may have been used to store food, like a refrigerator.*

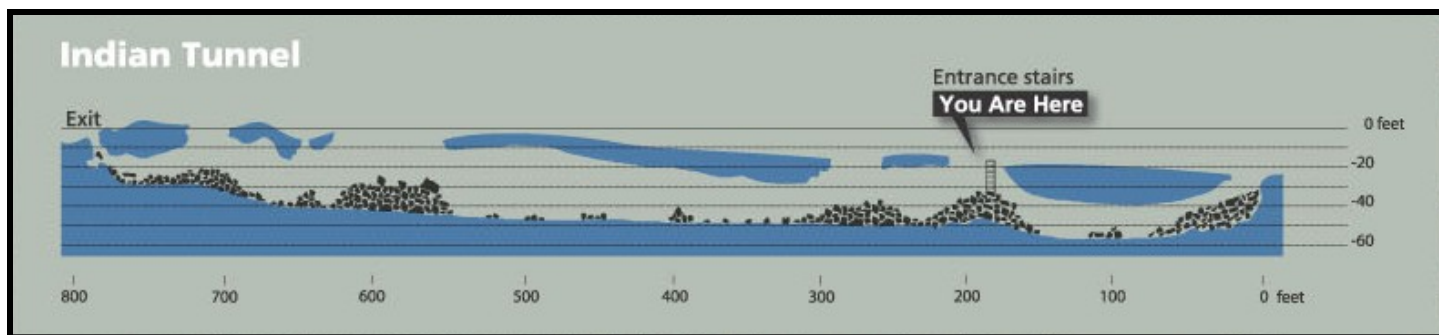


# Indian Tunnel: Cave Safety

**Location:** Entrance to Indian Tunnel at the stairwell

Caves are dark, have low ceilings, and uneven terrain. Going all the way through Indian Tunnel requires climbing over piles of boulders. Individual rocks can shift underfoot. Follow these tips to ensure a safe experience for you, your students, and chaperones:

- **No running.** This includes inside the cave as well as the surface trail.
- **Take a flashlight.** Although most of Indian Tunnel is naturally lit, other portions of the tunnel as well as other caves are very dark inside.
- **Use the “buddy” system.** Have students pair up and stay together while exploring the caves.
- **Take a head count.** Count students before they disperse and again before you leave to make sure all are accounted for.
- **Post chaperones at each exit to direct students accordingly.** The opening next to the Rock Rings is another exit to Indian Tunnel, so you may want to post a chaperone at that exit as well.



As you descend the stairs, the main path to the left offers relatively level floors to make exploring easy. To exit the tunnel simply retrace your steps, or continue through the cave to the exit. This option requires boulder scampering over uneven rocks and crouching for a short distance. Once on the surface, watch out for openings as you hike back to the tunnel entrance.

## 6 - Indian Tunnel: Stalactites & Skylights

**Location:** Inside Indian Tunnel

Indian Tunnel is over 800 feet long and 40 feet tall in some places. The ceiling trapped heat as the lava flowed to create the lava tube. The ceiling has two obvious features: a spiked surface and openings.

Lava stalactites make the ceiling spiky. As lava flows through a tube, receding lava leaves molten rock on the ceiling. Also, heat from the still-flowing lava can remelt ceiling rock. The molten rock then drips to the floor, hardening to form small stalactites.



In several places the ceiling is missing. These are known as skylights for the natural light they let into a lava tube.

### ***Did you know?***

Skylights are a type of cold collapse.



### ***Next steps...***

Look for pieces of the ceiling with lava stalactites that have fallen to the floor. Examine the texture. How does the ceiling look where the rocks fell from? *The rocks have smooth surfaces instead of spiked surfaces.*

Have students explore Indian Tunnel, as a class or on their own. How many skylights are there in the cave? (Don't forget to count the entrance and exit.) *There are seven skylights in Indian Tunnel's ceiling.*

Look for another cave feature known as a lava curb or bathtub ring. These form along cave walls where the level of lava remained constant before dropping, leaving a small ridge of lava on the wall. *Several lava curbs are on a wall near the cave exit.*

## 7 - Indian Tunnel: Looking for Wildlife

**Location:** Inside Indian Tunnel

Indian Tunnel is used by birds, mammals, and insects. The most common creature found in the lava tube is the rock dove, or pigeon. Though not native to North America, they often roost near skylights and coo, and are sometimes mistaken for owls.

Violet-green swallows also roost near skylights in small holes in the rock. They are common from late-spring through summer. Several raven nests are in the cave, often near skylights. The nests are made of small, woody branches. Nest sites can be seen high on cave walls.



Violet green swallow chicks (left) and common ravens (right) both nest in Indian Tunnel.

Small mammals such as chipmunks and weasels are sometimes seen in caves, too. More common are insects that are drawn to the cool, moist conditions in the cave.



Chipmunks (left) sometimes visit caves for shelter. Bats (right) often roost in caves, but are seldom seen in Indian Tunnel.

### ***Next steps...***

**Name one advantage that a violet-green swallow has by nesting in a ceiling hole in Indian Tunnel.** *Small cavities provide shelter and safety from predators.*

**What other winged animal might live in a cave?** *Bats roost in caves during the day and some hibernate in them during winter. Some monument caves are used by mother bats to raise their young.*



## Additional Information

### Come Visit Again

After exploring Indian Tunnel, retrace the paved trail to Dewdrop Cave. Turn left to return to the parking lot. Turn right if you wish to explore Beauty or Boy Scout caves, both of which are much darker and smaller than Indian Tunnel.

### Other Resources

Additional curriculum materials are available on our website at <http://www.nps.gov/crmo/forteachers/curriculummaterials.htm>, including these to use while visiting the monument:

- **Indian Tunnel Scavenger Hunt**
- **Habitat: Where Life is At! Worksheet**
- **Teacher's Guide to the Broken Top Loop Trail**

### Notes